

Vulcanus versus Selandia or

The early history of the marine diesel engine

The paper traces the first applications of diesel engines to power ships at the beginning of this century. In particular the question whether the Dutch built "Vulcanus" or the Danish built "Selandia" held priority is answered. During the short investigation some other interesting points relating to the early history of the marine diesel engine became clear.

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In the spring of this year (1996) a group of Delft students of marine engineering together with some officer-students of the Naval College in Den Helder made an industrial visit to Northern Germany and Denmark.

The Delft marine engineering students are organised in a club named "Vulcanus", after the small Dutch tanker they thought was the first diesel-powered ship in the world. But as we intended to visit the former Burmeister & Wain works in Copenhagen (now MAN/B&W of course) and since we had heard of a ship called the "Selandia" we had a feeling that their might be a slight difference of opinion with our hosts as to the question: who were the first to install a diesel engine in a ship: the Dutch or the Danes.

When trying to answer it, the question must be put in a more precise way sin-

ce the case is somewhat complicated. It will also become clear that there is no real winner.

The real first was not in a real ship

To begin with, the first marine diesel-powered vessel was neither Dutch nor Danish: it was the French built canal barge "Petit Pierre". It was powered by a Dyckhoff/Bochet designed diesel engine based on an existing Sautter-Harle gasoline engine of very peculiar construction having one horizontal cylinder with two opposed pistons. It had a bore of 210 mm and a stroke of 300 mm for each piston; it produced 25 bhp at 360 rpm. The ship had reversible propeller blades since the engine was non-reversible.

The "Petit Pierre" sailed in september 1903 on the Marne-Rhine canal but one can argue that it was 'only' an inland ship.

So we now focus our attention to sea-going application of the diesel engine.

Sea-going marine diesel engines: submarines

Here again the French were the first: the first sea-going marine diesel engine was also a Sautter-Harle engine installed in the French submarine "Z" as early as 1904. It was a 120 bhp engine built according to the same principles as the engine for the "Petit Pierre": in fact it consisted of two such engines enlarged and built together on a shaft with a flywheel in between. It also introduced another new feature: torsional vibrations! The original engine had to be replaced by a new one of a more conventional design. Both were non-reversible engines and the submarine used the electric motor not only for submerged sailing but also for manoeuvring at the surface.

Interesting is that the "Z" was a true

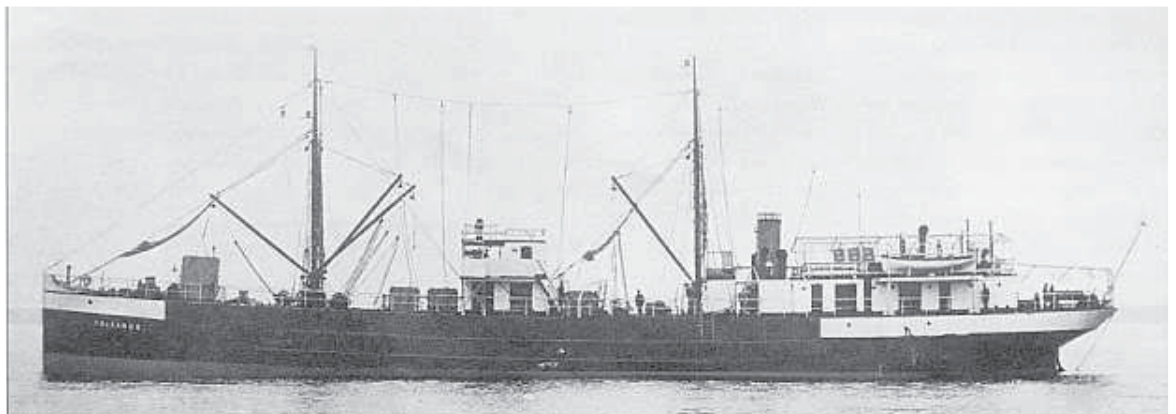


Fig.1. The 1216 dwt Dutch tanker ms "Vulcanus" of 1910, powered by a Werkspoor diesel engine of 450 bhp (Werkspoor museum).

tear-drop submarine, this in contrast with the next diesel submarine built by the French, the 'Aigrette' which had a hull which was optimised for surface sailing. This boat had a more conventional 4 cylinder, 4-stroke engine of 200 bhp. In 1905 the two boats (the "Z" re-powered) ran against each other, the result of which was a preference for the "Aigrette" despite the fact that the "Z" proved to be somewhat faster underwater.

By 1911 the French had at least 60 (!) diesel-powered submarines, while the British came second with 13 submarines, the latter powered by Vickers engines.

Starting in 1903 MAN Augsburg began production of marine diesel engines and these all went into (mostly German) submarines.

The St Petersburg based Nobel factory developed 4-stroke engines for the Russian Navy, the first being for the submarine "Minoga" in 1908. This engine was reversible.

MAN Nurnberg started in 1907 with 2-stroke diesel engines for the marine industry. In 1911 diesel engines went into a Dutch submarine ("02"). They had two Nurnberg built MAN 2-stroke engines with type designation S D 30/6: from their 6 cylinders they delivered 300 bhp at 500 rpm. The "02" was the first of a series of four submarines. Bigger engines went into the "K1" which entered service in 1913. The engines for this submarine were also MAN Nurnberg 2-stroke engines, now however type designation S D 85/8: with 8 larger cylinders they delivered 850 bhp at 450 rpm; specific weight was only 18 kg/ bhp.

Marine diesel engines for the merchant navy

From the previous chapter it is clear that the first marine diesel engine was neither Dutch nor Danish but French but also that it was used for a naval application.

Now focusing on the merchant navy the first diesel engines were installed from 1907 onwards.

An example of a diesel engine built as an auxiliary engine into a sailing ship (in fact a 'hybrid' propulsion concept) was the coastal schooner "Orion" built in 1907 with a Swedish engine from A.B. Motorer. The same firm delivered the 120 bhp, 300 rpm, 2-stroke, reversible engines for the 350 dwt cargo ships "Rapp" and "Schnapp" that were com-

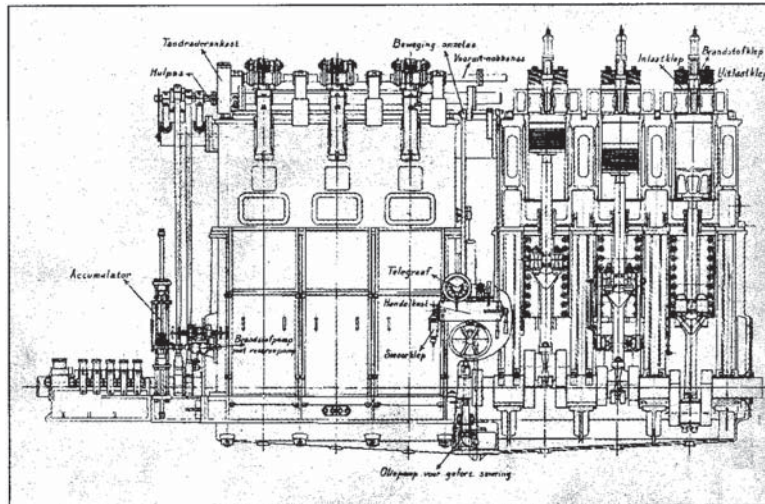


Fig.2. Werkspoor diesel engine of 450 bhp used in ms "Vulcanus" (Werkspoor museum).

missioned in 1908. They seem to have sailed in Sweden's inland waters but also in the Baltic and on the North Sea from Finland to Scotland. So, although being small coasters, they are the first commercial sea-going application of diesel engines. The reversing mechanism for the engines of these ships were according to the Hesselman patent.

Also in 1908 the Russians built the Caspian Sea tanker "Djelo" of 4000 dwt. It was powered by two 500 bhp, 150 rpm engines with 450 x 680 mm bore and stroke which was made by the firm Kolomna and was based on a Nobel design. Astern thrust was accomplished by reversing gears operated through pneumatic clutches. In the next year 1909 it was followed by two slightly larger tankers with even bigger diesel engines. In 1910 the 1740 dwt "Robert Nobel" was delivered with reversible engines. At the end of 1910 there were already 30 diesel engine powered vessels in the south of Russia. One could however argue that these were not really sea-going applications.

In 1910 an A.B. Diesel Motorer engine was installed in Amundsen's "Fram" (still to be seen in Oslo nowadays). This was the famous 4-cylinder, 180 rpm "Polar" engine and the ship sailed in August 1910 with the engine installed. But the "Fram" was of course a sailing ship with an auxiliary engine.

In the same year 1910 the 1000 t cargo vessel "Romagna" was built and launched in Italy. It had a 2-stroke, 4 cylinder (310 x 460 mm bore and stroke) Sulzer engine of 380 bhp at 250 rpm. It probably went to sea as early as October 1910 but it was ill-fated: it capsized in November 1911 and went down.

A very interesting engine was built in 1910 also: a light weight V-8 diesel

engine built by Nobel of St Petersburg. It was a 200 bhp, 600 rpm engine weighing only 10 kg/bhp. The engine was intended for Emanuel Nobel's yacht "Intermezzo" which actually seems to have sailed with it, although reliability was poor. It served also as a prototype for Nobel's lightweight submarine diesel engines built in 1910 to 1912.

Vulcanus and Selandia: ocean-going applications

Then in 1910 Shell's transport subsidiary, the Anglo-Saxon Petroleum Co, ordered a small tanker, the 1216 dwt (2047 ton displacement) "Vulcanus". It had a 6-cylinder reversible Werkspoor engine producing 450 bhp at 180 rpm. Its bore and stroke were 400 and 600 mm. The reversing mechanism was based on a Dyckhoff patent of 1899 but improved by a patent of Werkspoor engineer Verloop.

The "Vulcanus" went to sea in December 1910 and remained in service until 1932! It mainly sailed in the far East between Borneo and Singapore, so it was ocean-going indeed. In a comparison with a comparable steam driven tanker Shell found that the diesel powered "Vulcanus" consumed 2 tons of oil versus 11 tons of coal for the steamship; also the crew was reduced to 16 instead of 30. One can say that the ship probably was a commercial success.

In 1911 the Swan Hunter built ore carrier "Toiler" made the first trans-atlantic crossing to Canada where it was used on the great Lakes. It had a "Polar" diesel engine built by Swan Hunter under a licence from A.B. Motorer of Sweden.

The "Selandia", first of a series of three cargo ships, was launched on November 4, 1911. She was a 7400 dwt (10.000 ton displacement) ship of re-

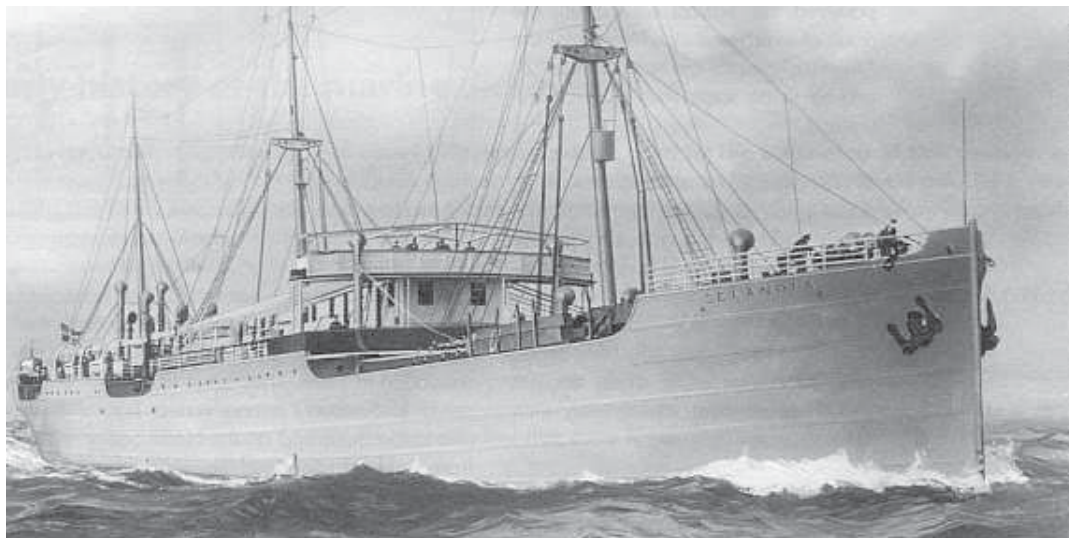


Fig.3. The 7400 dwt Danish cargo ship 'Selandia' built 1912, powered by two Burmeister & Wain diesel engines of 1050 bhp each (MAN-Rollo)

markable appearance: white painted and no funnel (the exhaust went up through the rear mast).

Each of their twin propellers was driven by a Burmeister & Wain 8 cylinder, 4-stroke engine of 1050 bhp at 140 rpm. Its maximum bmep was 6.4 kg/cm² at 129 rpm. The engine trials were in November – December 1911 and the ship's maiden voyage took place in early February 1912. The ship attracted much publicity with visits from the royal Danish family and, during its visit to London from Winston Churchill, then First Lord of the Admiralty. At the time the ship certainly was the largest commercial diesel powered ship and it served until 1942 when it sank with her original engines still on board. The ship undoubtedly started B & W undisputed leadership in the building of large marine diesel engines for many years thereafter.

Conclusion

The first application of a diesel engine in a ship was in 1903; ship and engine were French and the ship was a small inland cargo ship.

The years 1904 onwards saw the introduction of diesel engines in submarines, also led by the French but soon followed by the British, German and Russian Navies.

The first commercial diesel engine coasters were Swedish: the "Rapp" and "Schnapp" sailed as early as 1908 between Finland and Scotland with their Sweden built A.B Motorer diesel engines.

Although the Sulzer engine, Italian built "Romagna" and the Werkspoor powered, Dutch built "Vulcanus" both went to sea at the end of 1910, the latter proved to be probably the first normal reasonably big ocean going ship that was commercially successful. Anyway she was the first diesel-powered merchant vessel in Holland and just preceded the navy's submarine "02" which stemmed from 1911.

The Danish built "Selandia" definitely was not the first diesel engine ship but being a real big ship it set the pace for large marine diesel engines.

Sources

Practically all information contained in this short paper was derived from the excellent book on the first 20 years of the diesel engine: C. Lyle Cummins, Diesel's engine, Carnot Press, Oregon 1993.

The illustrations for this paper were kindly provided by the Werkspoor museum in Amsterdam and the MAN/B&W representative in Holland, MAN-Rollo B.V. in Zoetermeer.

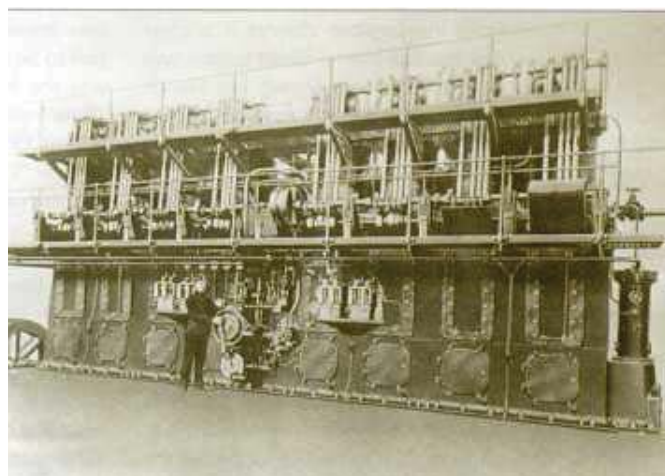


Fig.4. Burmeister & Wain diesel engine of 1050 bhp used in ms "Selandia" (MAN-Rollo).